This examination consists of two parts. The first, worth 60 points consists of three problems each worth 20 points. You are to answer three of your choice. If you answer four, I will base your grade on the three with the lowest scores. The second part of the exam, worth 55 points, is an analytic essay. Instructions for the essay are found in the second section of this examination. The examination is scheduled to last two and one half hours

Part A:

1. We are estimating several models of the impact of salary on absence behavior. Being as specific as possible, explain the effect of a one unit change in the explanatory variable on absence in each of these specifications. The variables in the model are:

   Days Absent Number of days absent in the last year
   Salary Annual salary in thousands of Euros (you see, even our exams are global in perspective!)
   Ln Natural Log

A. Days Absent = 10 - .02*salary

   **A ONE THOUSAND EURO INCREASE IN SALARY IS ESTIMATED TO REDUCE THE NUMBER OF DAYS ABSENT BY 0.02.**

B. Ln(Days Absent) = 3 - .004*salary

   **A ONE THOUSAND EURO INCREASE IN SALARY IS ESTIMATED TO REDUCE THE NUMBER OF DAYS ABSENT BY 0.4%.**

C. Ln(Days Absent) = 3 - .1*ln(salary)

   **A 1% INCREASE IN SALARY IS ESTIMATED TO REDUCE THE NUMBER OF DAYS ABSENT BY 0.1%. 0.1 IS THE ELASTICITY OF “DAYS ABSENT” WITH RESPECT TO SALARY.**

D. Days Absent = 10 - .03*salary + .0004*salary^2
THE EFFECT OF SALARY ON “DAYS ABSENT” CAN BE EXPRESSED AS:

-0.03 + 2*0.0004*SALARY

OR

-0.03 + 0.0008*SALARY

2. In 1998 W Andres and C. Christenson published a pioneering study of underground coal mining safety in which a major purpose was to determine the impact of the 1952 Mine Safety Act on mine fatalities. One of the goals of the legislation was to cut down on the high accident rate in small mines. The authors hypothesized that mine fatalities were a function of the level of mine technology, average mine size and mine safety regulation. The authors also suggest that (1) increased use of technology such as long wall mining devices will reduce fatalities, (2) larger mines are safer, (3) fatalities will increase with the amount of coal mined and (4) the effect of war periods are ambiguous as there is a drive for production even at the expense of safety but manpower shortages may encourage greater attention to safety. Consider the following estimated equation (standard errors in parentheses).

\[ F_t = 3.49 + 0.023{T_t} - 0.017{S_t} + 0.005{O_t} - 0.028{R_t} - 0.77{W_t} \]

\[ (0.005) \quad (0.006) \quad (0.012) \quad (0.163) \quad (0.107) \quad (0.012) \]

\[ n = 54 \quad r^2 = .665 \quad r^2 = .665 \]

Standard Error in ( )

Where

- \( F_t \) fatal injuries per million man hours worked in year t
- \( T_t \) percent of year t’s output that was mined by long wall mining devices
- \( S_t \) percent of industry output from mines with at least 100 employees in year t
- \( O_t \) tons of coal produced per man-hour in year t
- \( R_t \) a regulation dummy equal to 1 for 1953 to
- \( W_t \) a dummy indicating a year in which the United States was involved in a major war or armed conflict
A. Is this estimate consistent with the authors’ hypotheses that the Mine Safety Act of 1952 reduced mine fatalities? Explain your answer. Use 10%, 5% and 1% tests for the hypotheses.

\[
H_0: \beta_R \leq 0 \\
H_A: \beta_R > 0
\]

\[
t = \frac{0.028 - 0}{0.107} = 0.262
\]

THE CRITICAL VALUES FOR A ONE TAIL TEST WITH n-k-1 = 48 ARE:

- 10%: 1.28
- 5%: 1.64
- 1%: 2.33

|0.262| IS NOT GREATER THAN 1.64. CANNOT REJECT H_0

THE ESTIMATE NEGATIVE WHICH IMPLIES THAT REGULATION DECREASED FATALITIES, WHICH IS IN KEEPING WITH OUR HYPOTHESIS, BUT IT IS INSIGNIFICANT AT 10%, 5% AND 1%

B. Set up the authors’ hypotheses with respect to the other variables in the model.

\[
H_0: \beta_T \geq 0 \\
H_A: \beta_T < 0
\]

\[
H_0: \beta_S \geq 0 \\
H_A: \beta_S < 0
\]

\[
H_0: \beta_O \leq 0 \\
H_A: \beta_O > 0
\]

\[
H_0: \beta_T = 0 \\
H_A: \beta_T \neq 0
\]

C. Are the rest of the estimated coefficients consistent with the authors hypotheses about their effect on fatalities? Be sure to justify your answer using the methods of this course. Use 10%, 5% and 1% tests for the hypotheses.

The critical values for 10%, 5% and 1% one tail tests with 48 degrees of freedom are: 1.28, 1.64 and 2.33.

The critical values for 10%, 5% and 1% two tail tests with 48 degrees of freedom are: 1.64, 1.96 and 2.58.

<table>
<thead>
<tr>
<th>t = 3.83</th>
<th>t = -1.42</th>
<th>t = 0.31</th>
<th>t = -64.17</th>
</tr>
</thead>
</table>
| Significant at all levels but estimate does not have hypothesized sign. Cannot reject H_0. | Significant at 10% and has the expected sign. Reject H_0 at 10% level. | Not significant | Highly significant at all levels.

OUR HYPOTHESIS ABOUT SAFETY TECHNOLOGY IS UNSUPPORTED, OUR HYPOTHESIS ABOUT SIZE IS SUPPORTED AT THE 10% LEVEL, OUR HYPOTHESIS
ABOUT TONS OF COAL PRODUCED IS NOT SUPPORTED AND OUR HYPOTHESIS ABOUT WAR YEARS HAVING A SIGNIFICANT EFFECT IS SUPPORTED AT ALL LEVELS.

3. We are interested in the effect of pay structures on the performance of bank branches as measured by the growth of consumer loans over a two year period. We have data on one hundred branch bank offices in a state. We also have data on the characteristics of each branches geographic market. Although we care about these other factors, we are mainly concerned with the effects of pay practices and will focus on that.

The pay practice variable we have in our data set is coded as:

1. all workers are paid an hourly wage or salary but there are no bonus payments.
2. workers receive bonus payment related to individual performance in addition to their hourly pay or salary
3. workers receive bonus payment related to the overall performance of the branch in addition to their hourly pay or salary
4. workers receive bonus payment related to individual performance and overall branch performance in addition to their hourly pay or salary.

The pay practice variable is designated as $PP_t$

A. A colleague of ours proposes estimating an equation of the form

Loan Growth = $\beta_0 + \beta_1*PP_t + \text{many control variables}$

Discuss the strengths and weaknesses of this specification of the Pay Practice variable. If there is a better specification, explain how to operationalize that specification and why it is superior.

THE WAY IN WHICH THE PAY PRACTICE VARIABLE IS CURRENTLY SPECIFIED DOES NOT MAKE SENSE. THE COEFFICIENT WILL NOT HAVE A MEANINGFUL INTERPRETATION. THE VARIABLE SHOULD BE SPLIT INTO THREE DUMMY VARIABLES AND THE OMITTED CATEGORY WILL BE THE BENCHMARK OR DEFAULT VALUE. FOR EXAMPLE, IF CATEGORY 1 IS OMITTED THEN THE INTERCEPT TERM WILL BE THE AMOUNT OF LOAN GROWTH ATTRIBUTED TO WORKERS WHO RECEIVE AN HOURLY WAGE OR SALARY BUT NO BONUS PAYMENTS. THE OTHER THREE VARIABLES WILL ENTER THE REGRESSION LINEARLY AS DUMMY VARIABLES. THE COEFFICIENTS ARE INTERPRETED RELATIVE TO THE BENCHMARK
4. Health care costs are growing rapidly and control of these costs is an important element in firms compensation strategy. Most researchers suggest that the growth of health care costs rises with the age of the firms workforce, the number of families in that workforce, and the number of health care providers offered to employees. Costs are lower for firms which offer managed care plans. We are interested in testing whether larger firms have lower health care costs and whether larger co-pays are associated with lower costs. The theory with respect to firm size is that the greater bargaining power of large firms should allow them to force down health care premiums. The effect with regard to co-pays is less certain. Increasing the co-pay should reduce firm’s medical costs because, surprise surprise, the firm pays less and the employee pays more. But as people delay going to the doctor when they are sicker, each trip results in higher costs.

We obtain data on 1,000 firms to test our hypotheses. Our variables are:

- **MCE** Annual Medical Cost per employee
- **%FAM** Percent of the workforce with family medical insurance
- **#PLAN** Number of Health Care Plans Offered
- **SIZE** Number of Employees
- **MANAGED** Firm Offers a managed care plan
- **CO-PAY** Dollar cost of the co-pay for a doctors visit
A. The estimate for this model is

\[ MCE = 4000 + 3000 \times \%FAM - 800 \times \#PLAN - 0.23 \times SIZE - 300 \times MANAGED + 450 \times CO-PAY \]

(2000) (1900) (600) (.15) (126) (350)

\[ r^2 = 0.50 \quad r^2 = 0.48 \]

Standard errors in ( )

Do these estimates support our hypotheses about the effects of firm size and co-pays? Use 10%, 5% and 1% tests for the hypotheses.

<table>
<thead>
<tr>
<th>H₀: ( \beta_S \geq 0 )</th>
<th>H₀: ( \beta_{CP} = 0 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hₐ: ( \beta_S &lt; 0 )</td>
<td>Hₐ: ( \beta_{CP} \neq 0 )</td>
</tr>
<tr>
<td>t = -1.53</td>
<td>t = 1.29</td>
</tr>
</tbody>
</table>

Critical values for 1 tail 10%, 5% and 1%:
1.28
1.64
2.33

Critical values for 2 tail 10%, 5% and 1%:
1.64
1.96
2.58

Sign is as expected.
Reject H₀ at 10%.
Do not reject at 5% and 1%

Cannot reject H₀ at any level.

OUR HYPOTHESIS WITH RESPECT TO FIRM SIZE IS SUPPORTED AT THE 10% LEVEL. OUR HYPOTHESIS WITH RESPECT TO CO-PAY IS NOT; THE COEFFICIENT ON COPAY IS NOT STATISTICALLY SIGNIFICANTLY DIFFERENT FROM 0.

B. We are concerned about the assumption that firm size has a linear relationship to medical costs? Why might we expect the relationship to be non-linear?

WE MAY BE CORRECT THAT FIRM SIZE REDUCES MEDICAL COSTS DUE TO THE ABILITY TO BARGAIN FOR LOWER PREMIUMS BUT THIS REDUCTION CAN ONLY TAKE COSTS SO LOW. AT SOME LEVEL, THE EFFECT OF FIRM SIZE SHOULD BE 0 BECAUSE MEDICAL COSTS CAN ONLY BE REDUCED SO LOW. IF WE MODEL THIS RELATIONSHIP LINEARLY, THEN FOR SOME VERY LARGE FIRMS, WE COULD END UP WITH A NEGATIVE ESTIMATE FOR MEDICAL COSTS. THAT WOULD NOT MAKE ANY SENSE.
C. We re-estimate our model with firm size entered in a polynomial form.

\[ MCE = 3500 + 3200\%FAM - 800\#PLAN - .30\text{SIZE} + .0044\text{SIZE}^2 - 300\text{MANAGED} + 523\text{CO-PAY} \]

\[ (1500) \quad (1800) \quad (500) \quad (.14) \quad (.0015) \quad (110) \quad (290) \]

\[ r^2 = .60 \quad \bar{r}^2 = .58 \]

Based on this estimate, what is the relationship between size and medical costs? Between co-pays and medical costs? Is there evidence that this estimate is better than the estimate in which size has a linear relationship to medical costs. Use 10%, 5% and 1% tests for the hypotheses.

THE RELATIONSHIP BETWEEN FIRM SIZE AND MEDICAL COSTS IS EXPRESSED BY:

-0.30 + 2\times0.0044\times\text{SIZE}

OR

-0.30 + 0.0088\times\text{SIZE}

THE COEFFICIENT ON FIRM SIZE IS SIGNIFICANT AT THE 5% LEVEL IN A 1 TAIL TEST. THE COEFFICIENT ON FIRM SIZE\(^2\) IS SIGNIFICANT AT ALL LEVELS.

THE RELATIONSHIP BETWEEN CO-PAYS AND MEDICAL COSTS IS THAT A ONE DOLLAR INCREASE IN CO-PAY INCREASES MEDICAL COSTS BY $523, AND IS SIGNIFICANT AT THE 10% LEVEL.

SINCE THE DEPENDENT VARIABLES ARE THE SAME BETWEEN THE TWO MODELS, WE CAN COMPARE \(r^2\) AND SEE THAT IT IS HIGHER FOR THE SECOND MODEL. THIS IS EVIDENCE THAT THIS ESTIMATE IS BETTER THAN THE LINEAR ESTIMATE.
Part B: Essay (40 points)

Applying what you have learned in this course, describe and review “Are Salaried Workers Compensated for Overtime Hours,” by Monica Cherry (Journal of Labor Research, Summer 2004) The essay should review the issues addressed by the article and the hypotheses tested; the appropriateness of the data to the topic, the strengths and weaknesses of the specification, the statistical findings and the conclusions. The essay should focus on how these factors affect the usefulness of the article in understanding the issue under consideration. Although grading will be focused on the content of the essay, clarity in argumentation is appreciated.

“Are Salaried Workers Compensated for Overtime Hours?”

Monica Cherry
Journal of Labor Research, Summer, 2004

This article investigates whether workers who are exempt from the overtime provisions of the Fair Labor Standards Act earn more if they work additional hours. Although salaried workers are typically paid an amount which is not formally tied to their hours of work and are typically exempt from the overtime provisions of the FLSA, the theory of human capital and of compensating differentials both suggest that their pay should increase with their hours of work. Using the Panel Study of Income Dynamics, a data set which is regularly used to investigate labor market issues, the authors estimate the effect of both weekly hours and average weekly hours for the last three years on the current annual labor income of almost 600 individuals who have been in exempt salaried positions with their current employer for at least three years. The author finds that earnings rise with both current weekly hours and average weekly hours for the prior three years. Further, the author finds that the change in earnings over the last three years is also positively affected by current and average past hours. The increase in earnings is however, considerably lower than these employees would earn if they received their average hourly earnings for every additional hour of work.

Although establishing that earnings rise with hours of work for exempt salaried workers is an important topic, the article does not address whether salaried workers are compensated for overtime hours. Rather it only measures whether additional hours of work, whether they are under forty or over forty per week, are compensated. Further, the failure to control for the effect of occupation on earnings and the restrictions on the sample both limit the usefulness of the estimates obtained from this study.

The Research Question:

Salaried employees who are exempted from the Fair Labor Standards Act do not have a legal right to overtime payments for work after 40 hours per week. Indeed, absent specific provisions of individual employment contracts, there is no requirement for additional payments for hours worked beyond the normally expected hours of work. Despite the lack of a legal basis
for a tie between the hours of work and pay for exempt salaried workers, markets forces may operate to create a tie between hours and pay. Human capital theory suggests that the accretion of human capital, and the consequent improvement in individual productivity, is closely linked to individuals annual hours of work. We would therefore expect that workers with higher working hours would be more productive, and earn more, than otherwise similar employees with shorter working hours. The theory of compensating differentials suggests that employees have to pay a premium wage to attract sufficient employees to onerous positions. Efficiency wage theory also suggests that the additional effort required of long hour positions requires additional payments in the form of higher salaries. The implications of these theories are that we would expect employees current and past hours of work to be positively associated with earnings and this is what the author has hypothesized.

The Data:

The study uses data from the Panel Study of Income Dynamics, a national longitudinal survey which is financed by the National Science Foundation and has been administered by the University of Michigan since 1969. The data used for this study covers the years from 1986 to 1990. Questions in the survey allow distinguishing between exempt and non-exempt employees. The data set includes data on weekly hours, weeks of work, earnings and personal characteristics for each year of the survey as well as data on the employer and spells of unemployment. Based on this data, exempt salary workers work considerably longer hours than non-exempt salary and hourly workers, and their average hourly compensation is considerably higher than that of other employees.

The Model

The author estimates a largely conventional model of earnings except in including both a measure of the respondents usual weekly hours in the last year, and the mean of the usual weekly hours in the prior three years. The control variables included in the model are fairly typical of earnings models in including education, potential experience (a close relative of age), tenure with the current employer, gender, marital status, racial status, and whether the individual was a public employee, lived in a city, in the Northeast, or was a manager. The specification was lean with regard to some variables, notably occupation. Although most exempt salaried workers will be managers or professionals, less aggregate controls for occupation would be appropriate as occupation, earnings and hours of work are closely linked. We will not be able to be sure whether our estimates suggest those who work longer hours are paid more or whether those who work longer hours are in occupations that are more highly paid.

There was also somewhat of a mismatch between the earnings and hours variables. Earnings are measured as real annual labor earnings, while the hours measures are weekly hours. The author addresses this by limiting the sample to full time, full year employees. This eliminates much of the variance in annual weeks of work, but at a cost of limiting the population to which these estimates pertain. We are no longer addressing all exempt salaried workers but rather only full time full year employees.
There is also a potential issue with the self-reporting of hours. Self-reporting is common in survey research on hours, but it can be problematic for individuals who are not on hourly rates and whose hours are not tracked closely. Research using time diaries suggests that there is a tendency for such individuals to believe they are working more hours than they actually work. One has to use the data one has, but usual hours measures for exempt salary workers is likely not too accurate and may be an upward biased measure.

The Estimates:

The author provides two sets of estimates: the first consists of four regressions in which the log of annual earnings for each of the four years in the data, 1987 to 1990, are regressed on currently weekly hours, past weekly hours and a set of personal characteristics, the second regresses the percentage change in annual earnings over three years on a similar set of explanatory variables.

The results for the controls in the first model are conventional. Education has a large positive and significant effect on the wage, potential experience and tenure have a convex (increasing but ever more slowly) relationship to earnings, women and minorities are paid less than white or male workers. Other controls are consistent with prior work and $r^2$ and $R^2$ adjusted are also reasonably similar to other research on earnings equations (if not actually somewhat higher than typical in such models).

The estimated coefficients on the hours variables generally support the author’s hypotheses. Current hours have a positive effect on earnings which is significant in a 5% or 1% one tailed test in three of the four models, the impact of prior earnings is also positive and significant in a similar one tailed tests in three of the four models. The impact of hours is however small. Using the 1987 estimates, a 1 hour increase in usual weekly hours raises earnings by 0.7%, a 1 hour increase is average past hours raises earnings by 0.82%. Both are very small increments, as the author demonstrated in Table 3, the marginal impact of another hour is well below individuals average hourly earnings. The conclusion is that there is compensation for additional hours, but there is not an hour for hour gain, much less the time and a half increment for work beyond forty hours provided to non-exempt workers under the FLSA.

The second equation considers the effect of changes in hours of work on the change in annual earnings over the last three years. The results again suggests that increased hours are associated with increased earnings, but the impact is small. A one hour increase in current weekly hours is associated with a 0.9% increase in annual earnings; an increase of one hour in average hours over the prior three years is associated with a 0.06% increase in annual earnings.

Conclusion and Comments:

Based on the results from these estimates, the author concludes that exempt full time employees who work longer average hours have higher annual pay. The caveat to this result is that the increase in pay associated with longer hours is well below the increase that would be expected if individuals were paid at their equivalent hourly rate for their additional hours.
One limitation of the study is that it does not measure whether an individual working beyond their usual working time received extra payment. Rather, it measures whether exempt workers who usually work longer hours receive additional pay. Second, the research does not measure whether the rate of payment for additional hours is higher for hours worked beyond forty. It does not measure whether salaried employees are compensated for overtime work, it measures whether they receive some increment for additional hours of work. Finally, omission of controls for occupation does not allow us to determine whether the relationship between hours and earnings is really just that, or whether occupations with higher salaries have longer hours of work. The distinction is important because, if the first holds, any exempt individual with longer hours would be expected to receive higher pay while if the second holds, we are really observing an occupational effect.